The Planters' Chronicle.

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THE U. P. A. S. I.

(INCORPORATED.)

Contents.

A valuable paper from the Scientific Officer on the results of Compost making by Mr. Wilkins, of Hoscottay is contributed, and with the accompanying table will prove most interesting.

The Philosophy of Manuring which we extract from the *Gardener's Chronicle* shows the value of investigation which confirms the old philosophy as practised at Rothamsted. It also, if read correctly, confirms the necessity of soil analysis, if the agriculturist is to get the full benefit of his soil.

Mr. Cyril Warren of Trinidad gives a short account of tapping some Ceara Plants in his nursery.

We conclude Professor Woods' address which will be read with much interest, though dealing largely with the fattening of cattle; but those portions that refer to selection of wheat seed, bring home the enormous value of seed selection. That the Famers of England are ready to receive information and benefit by experiments is clearly shown. The Planters of Southern India are no less intelligent and receptive. The indigenous agriculturist is harder to move and much more conservative in his ideas.

We publish an invigorating letter from Mr. Danvers whose reappearance in these columns is ever welcome, not only to ourselves, but to our readers. It marks with appreciative approval the efforts of others to keep in the straight line and not be led away by "the light that leads astray." Even where and when he differs with others, his remarks are always to the point.

A "Potential Competitor" and "Dyspeptic" also add their *quota*.

We are obliged to Mr. Clarke for furnishing us with a short leaflet on how to pack tea and have much pleasure in publishing it.

We regret to say that there is left on our hands a large quantity of the Discussion on the Labour Question which we had printed separately and which we hoped that members of District Associations would take to send Home to absent Proprietors and others whom the Book of Proceedings does not reach.

Scientific Officer's Papers.

CXXIV.—Composts.

In continuation of the work being done on Composts, some of which has already been reported upon in Scientific Officer's Paper 120., the results of an experiment made at Hoskottay Estate are now available.

This compost was made upon the lines adopted by Mr. Pittock as reported in the *Planters Chronicle* Vol. VII. p. 465. Two brick pointed pits were made and in these alternate layers of Pulp, Ashes, and Bone Meal were placed and when full straw pandals were constructed over the pits and the compost allowed to rot down until November when it was applied.

24 tons 3 cwts of raw material were originally put into the pits and this when rotted down gave 15 tons of Compost ready for application, a loss of about 38% taking place during the fermentation and composting. A sample taken gave the following analysis.

		Air dry sample.	Ash.	Calculated to dry material.
Moisture		10·40	—	—
*Organic Matter		30·39	—	33·92
Ash 59·21	Insoluble Matter	25·05	42·38	28·00
	Phosphoric Acid	4·34	7·33	4·85
	Potash	0·76	1·28	0·85
	Lime	5·89	9·95	6·58
	Other soluble Mineral matter ...	23·13	39·06	25·80
		100·00	100·00	100·00
*Containing Nitrogen		1·96	—	2·19

The Compost when sampled was of a cheesy composition and wet, containing actually 68·8% of moisture and then weighed 20 tons. Consequently this 20 tons of compost contained 6·24 tons of dry matter and from the analysis the monetary value of this can be calculated in terms of Nitrogen, Phosphoric Acid, and Potash and set against the actual cost of preparation and thus a profit and loss account can be made. For this purpose 1 lb. of Nitrogen is taken as costing 8½ annas bought as Ground Nut Poonac, 1 lb. of Phosphoric Acid as costing 2 annas 4 pies bought as Basic Slag, and 1 lb. of Potash as costing 2 annas 10 pies bought as Sulphate of Potash. These are the costs f.o.r. and cost of transport to the estate has been neglected, but it must be remembered that this is in some cases a con-

siderable item and when taken into account makes the compost more valuable than appears below. As set against this nothing has been charged for cost of application.

On this basis we get the following :—

COST OF MAKING.

		Rs.	A.	P.
2 Pits brick pointed 10 x 6 x 3	... ...	12	0	0
21 cwts. Bone Meal ...	... ...	89	4	0
Transport	... ...	10	0	0
21 tons Pulp 42 cwts. Ashes and Line Sweepings	Carrying and putting in the Pits	21	0	0
Straw pandals over the pits	... ...	3	12	0
	Total...	136	0	0

VALUE OF COMPOST.

		Rs.	A.	P.
6·24 tons of dry matter in compost contain :—				
306·1 lbs. of Nitrogen @ 8·5 as. per lb.	... ...	162	9	8
677·9 lbs. of Phosphoric Acid @ 2 annas 4 pies per lb.	...	98	13	9
118·8 lbs. of Potash @ 2 annas 10 pies per lb.	... ...	21	0	7
	Total...	282	8	0

This leaves a profit of about Rs.146 or, since there were 15 tons of the compost as applied, a profit of nearly Rs.10 per ton over and above the value of the manure. In addition to this the pits are still in good condition and need only a little repairing before being used again so that the Compost made in them next year will be still cheaper.

RUDOLPH D. ANSTEAD,
Planting Expert.

COFFEE.

The quantity of coffee exported in 1912, which includes 34 tons from the New Hebrides, amounted to 404 tons, valued at £33,092. Since the year 1903 coffee exports have advanced steadily, the average yearly increase having been slightly over 71 tons. The quantity exported during the five years 1907-1911 averaged 454½ tons a year. In 1912, however, owing to the ravages of the coffee plant-disease, known by the name *Hemileia vastatrix*, there was a decrease in the exports as compared with 1911. This disease, which made its appearance here towards the end of 1910, has done much damage, and in spite of all efforts to stop it is still spreading slowly. Some plantations have been completely, others as yet only partially destroyed, the the timely spraying of the plants with *Bouillie Bordelaise* (a preparation containing sulphate of copper) having had the effect of checking, though not, as it had been hoped, of eradicating the disease. Many plantation owners are now discarding the *Arabica* for the *Robusta* variety, which offers greater resistance to the disease, whilst others, having lost all or most of their plants, are substituting cotton for coffee. The present area under coffee is estimated to be about 1,500 hectares (3,705 acres). The quality of New Caledonian coffee is very good.—*Diplomatic and Consular Reports, France.*

THE PHILOSOPHY OF MANURING.

The principles which guide the practical man in his choice of manures and fertilisers are simple and well known. In the first place the growing plant requires large quantities of water, if only to repair the inevitable and continuous loss of water vapour from the leaves. The plant itself contains an extraordinarily large percentage of water, and all the chemical operations which take place in it depend for their fulfilment on a larger or smaller quantity of water in the tissues of the plant. Hence if he is to obtain larger crops the gardener must see to it that an adequate supply of water is available to the plant. It is not enough for him—even where it is practicable—to add water: he must build up a soil of such constitution that it will both hold water and part with it readily to the plant. Since decaying organic matter, farmyard manure, for example, imparts this property to the soil, this class of substance is looked upon as an ideal manure.

In the second place, the practice of manuring depends on the well established fact that certain mineral substances, and particularly nitrogen compounds, potash and phosphoric acid, are essential plant foods. Hence the art of manuring consists in the amelioration of the water conditions of the soil and in supplying deficiencies in what may be called the feeding capacity of the soil. There is, however, a third principle, which is no less important, but which is apt to be overlooked. That principle is an economic one. The gardener must secure the conditions which we have indicated at the minimum of cost.

By the addition of dung in sufficiently large quantities an adequate amount of essential food may be provided; but since dung contains relatively small quantities of such an essential as phosphoric acid it is evident that a more economical method of manuring consists in adding, together with a small amount of dung, some phosphatic fertiiizer, such, for example, as basic slag.

In recent years these old-established principles have been challenged, and we have been asked to revise the articles which constitute the philosophy of manuring.

The new philosophy, which has been urged by Messrs. Whitney and Cameron, of the Bureau of Soils, holds that all soils contain large stores of the essential foods, phosphates and potash, that the water in the soil—the soil solution—contains enough of these substances for the purpose of plant growth, and that one soil is not more fertile than another because it is richer in such mineral substances as potash or phosphates, but primarily because it is in better case to supply the crop with all the water which it requires. A second cause of the inferior fertility of certain soils is found by Messrs. Whitney and Cameron to lie in the existence therein of toxic substances produced by the roots of previous crops, and left in the soil to the detriment of the growth of the plants which succeed these crops.

In order to meet the objection that artificial potash and phosphatic manures are known to increase soil fertility these investigators urge that the fertilisers act, not by supplying food to the plant, but by putting the toxic soil-substances out of action.

From the point of view of immediate practice the newer hypothesis is not important; but from that of the ultimate practice of manuring no less than from the point of view of scientific horticulture it is of very great importance indeed. Hence the investigations carried out by Mr. A. D. Hall and his colleagues at Rothamsted, and published recently by the Royal Society, are particularly opportune.

The net result of these investigations is to vindicate the older view, and to show that the revolutionary toxic hypothesis is without foundation. The conclusions reached by Mr. Hall, which are of greatest interest, are, first, that the Rothamsted plots, which are to-day producing poor crops owing to the fact that essential foods—now Potash, now phosphoric acid—have been withheld during the past sixty years, yield good crops when their *particular* deficiencies are made good. Thus a phosphorus-starved soil gives a normal good crop when phosphatic manures are added to it, and similarly a potash-starved soil recovers its fertility when its defect of potash is made good.

Second, although the soil of such plots has carried continuously for the past 60 years crops of one kind only—wheat in some cases, barley in others—water extracts from the soil are found to have no toxic action whatever on the roots of similar or different plants.

Hence the toxic theory of soil fertility may be dismissed, or at most regarded as of very limited applicability.

Third, the Whitney-Cameron hypothesis that all soils contain enough potash and phosphates for plant-feeding purposes is shown to be improbable. For Hall demonstrates that, as we might expect on the old view, the feeding value of a soil extract increases within wide limits with its concentration. That is to say, a solution which contains *more* potash or phosphates produces bigger crops than one which contains less of the substances. Naturally, there is a limit to this law that concentration increases crop, and as we all know, an excess of a soluble fertiliser may result in no crop at all. The rôle, therefore, of the artificial fertiliser is to bring the "soil solution" up to the maximum beneficient concentration, and we may still hold the common-sense view that fertilisers used as supplements to dung exert their beneficial effects by reason of the plentiful supplies of specific foods which they put at the disposal of the plant.—*The Gardeners' Chronicle.*

Tapping Ceara Plants.

The fall in price is causing so much apprehension among the producers of plantation rubber can be met in some measure by improvement in methods of production. That there is room for improvement there can be no doubt, and therefore records such as the *following, though dealing with* matters of detail only, are of a somewhat general interest:—

I have recently been tapping some Ceara Plants (Manihot Glaziovii) at my nursery in Dabadia, Trinidad. They were planted about ten years ago, at an elevation of 20 to 300 feet, and this is the first time they have been tapped. The outside bark was first peeled off, as it would be too tough to cut with a knife. A herring-bone tapping was then made on one side of the tree and a boy stationed by the side with a syringe, from which he supplied a constant slight flow of water down the centre cut. In this way quite a large quantity of latex was obtained, which was afterwards coagulated by means of an 8 per cent solution of lime juice or by sulphuric acid. The slabs thus formed were taken the next day out of the coagulating pans and placed to dry on shelves lined with perforated zinc. When dry they were removed to an air-tight chamber, and smoked for fifteen mintues over a charcoal fire on which were placed seeds of the Koperite Palm (Maximiliana Martiana). The temperature of the room was maintained at about 80° to 90° When the smoking was completed the rubber was placed in powdered sulphur, which helps to keep it in condition. *Cyril Warren, Dabadia, Trinidad.—The Gardeners' Chronicle.*

THE BRITISH ASSOCIATION AT BIRMINGHAM.

SECTION M.

Agriculture.

Opening Address by Prof. T. B. Wood, President of the Section.

(*Continued.*)

The suggestion that ordinary soils contained a factor which limited their fertility emanated in the first instance from the American Bureau of Soils. The factor was at first thought to be chemical, and its presence was tentatively attributed to root excretion. Certain organic substances, presumably having this origin, have been isolated from sterile soils, and found to retard plant growth in water-culture. It is claimed, too, that the retardation they cause is prevented by the presence of many ordinary manurial salts with which they are supposed to form some kind of combination.

Contributions to the subject have come from several quarters, but whilst the suggested presence of an inhibitory factor has been generally confirmed, its origin as a root-excretion and its prevention by manurial salts has not received general confirmation outside American official circles. The matter has been strikingly cleared up by the work of Russell and Hutchinson at Rothamsted, who observed that the fertility of certain soils which had become sterile was at once restored by partial sterilisation, either by heating to a temperature below 100°C., or by the use of volatile antiseptics such as toluene. This observation suggested that the factor causing sterility in these cases was biological in nature that it consisted, in fact, of some kind of organism inimical to the useful fermentation bacteria, and more easily killed than they by heat or antiseptics. After a long series of admirable scientific investigations these workers and their colleagues have shown that soil cotained many species of protozoa, which act upon the soil bacteria, whose numbers they keep within definite limits. In certain circumstances, such, for instance, as those existing in the soil of sewage farms, and in the artificial soils used for the cultivation of cucumbers, tomatoes, &c., under glass, the protozoa increase so that the bacteria are reduced below the numbers requisite to decompose the organic matter in the soil into substances suitable for absorption by the roots of the crop. Practical trials of heating such soils, or subjecting them to the action of toluene, or other volatile antiseptics, have shown that their lost efficiency can thus be easily restored, and the method is now rapidly spreading among the market gardeners of the Lea Valley.

I have attempted to sketch the chief points of this subject with some detail in order to show that strictly scientific work, quite outside the scope of what some people still regard as "practical," may result in discoveries which, apart from their great academic interest, may at once be turned to account by the cultivator. The constant renewal of expensively prepared soil which becomes "sick" in the course of a year or so is a serious item in the cost of growing cucumbers and tomatoes. It can now be restored to fertility by partial sterilisation at a fraction of the cost of renewal, and considerable sums are thus saved by the Lea Valley growers.

For my second instance of scientific work which has given results of direct value to farmers, I must ask to be allowed to give a short outline of the wheat-breeding investigations of my colleague Prof. Biffen. Even as late as fifteen years ago plant-breeding was in the purely empirical haphazard stage. Then came the rediscovery of Mendel's laws of heredity, which

put in the hands of breeders an entirely new weapon. About the same time the Millers' Association created the Home-grown wheat Committee, of which Biffen was a member. Through this committee he was able to define his problem as far as the improvement of English wheat was concerned. There appeared to be two desiderata: (1) The production of a wheat which would crop as well as the best standard home-grown varieties, at the same time yielding strong grain, i. e., grain of good milling and baking quality; and (2) the production of varieties of wheat resistant to yellow rust, a disease which has been computed to decrease the wheat crop of the world by about one-third.

The problem having been defined, samples of wheat were collected from every part of the world and sown on small plots. From the first year's crop single ears were picked out and grown on again. Thus several hundred pure strains were obtained. Many were obviously worthless. A few possessed one or more valuable characteristics: strong grain, freedom from rust, sturdy straw, and so on. These were used as parents for crossing, and from the progeny two new varieties have been grown thoroughly tested, and finally put on the market. Both have succeeded, but both have their limitations. Burgoyne's Fife, which came from a cross between strains isolated respectively from Canadian Red Fife and Rough Chaff, was distributed by the Millers' Association after a series of about forty tests, in which it gave an average crop of forty bushels per acre of grain, which milled and baked practically as well as the best imported Canadian wheat. It is an early-ripening variety which may even be sown as a spring wheat. It has repeatedly been awarded prizes for the best sample of wheat at shows, but it only succeeds in certain districts. It is widely and successfully grown in Bedfordshire and Dorset, but has not done well in Norfolk. The other variety, Little Joss, succeeds much more generally. In a series of twenty-nine trials scattered between Norfolk and Shropshire, Kent and Scotland, it gave an average of forty-four bushels per acre, as compared with forty bushels given by adjoining plots of Square Head's Master. It originated from a cross between Square Head's Master and a strain isolated from a Russian graded wheat known as Ghirka. Its grain is the quality of ordinary English wheat. It tillers exceptionally well in spring, and is practically rust-proof. Its one drawback is its slow growth during the winter if sown at all late. It has met with its greatest success in the Fen districts, where rust is more than usually virulent.

The importance of this work is not to be measured only by the readiness with which the seed of the new varieties has been tried by farmers and the extent to which it has succeeded. The demonstration of the inheritance of immunity to the disease known as yellow rust, the first really accurate contribution to the inheritance of resistance to any kind of disease, inspires hope that a new method has appeared for the prevention of diseases in general.

Biffen's work too shows the enormous value of co-operation between the investigator and the buyer in defining problems connected with the improvement of agricultural produce. It is open to doubt if a committee of farmers would have been able to define the problems of English wheat production as was done by the Millers' Committee, and in the solution of any problem its exact definition is half the battle. Mackenzie and Marshall in their work on the "Pigmentation of Bacon Fat" and on the spraying of sows for fattening, have found the great value of consultation with the staffs of several large bacon factories. There seems to be in this a general lesson

that before taking up any problem one should get into touch not only with the producers but with the buyers, from whom much useful information can be obtained.

I feel that Biffen's work has borne fruit in still another direction for which perhaps he is not alone responsible. Twenty years ago agricultural botany took a very subsidiary position in such agricultural examinations as then existed. In some of the agricultural teaching institutions there was no botanist, in others the botanist was only a junior assistant. It is largely due to the work of Biffen and the botanists at other agricultural centres that botany is now regarded as perhaps the most important science allied to agriculture.

I must here repeat that I am not attempting to make a complete survey of all the results obtained in the last twenty years. My object is only to pick out some of the typical successes and failures and to endeavour to draw from their consideration useful lessons for the future. So far I have not referred to the work which has been done in the nutrition of animals, and I now propose to conclude with a short discussion of that subject. The work on that subject which has been carried out in Great Britain during the last twenty years has been almost entirely confined to practical feeding trials of various foods or mixtures of foods, trials which have been for the most part inconclusive.

It has been shown recently that if a number of animals in store condition are put on a fattening diet, at the end of a feeding period of twelve to twenty weeks about half of them will show live-weight increases differing by about 14 per cent. from the average live-weight increase of the whole lot. In other words, the probable error of the live-weight increase of a single fattening ox or sheep is 14 per cent. of the live-weight increase. This being so, it is obvious that very large numbers of animals must be employed in any feeding experiment which is designed to compare the feeding value of two rations with reasonable accuracy. For instance, to measure a difference of 10 per cent. it is necessary to reduce the probable error to 3 per cent. in order that the 10 per cent. difference may have a certainty of thirty to one. To achieve this, twenty-five animals must be fed on each ration. Those conversant with the numerous reports of feeding trials which have been published in the last twenty years will agree that in very few cases have such numbers been used. We must admit then that many of the feeding trials which have been carried out can lay no claim to accuracy. Nevertheless, they have served a very useful purpose. From time to time new articles of food come on the market, and are viewed with suspicion by the farmers. These have been included in feeding trials and found to be safe or otherwise, a piece of most useful information. Thus, for instance, Bombay cotton cake, when first put on the market, was thought to be dangerous on account of its wooly appearance. It was tried, however, by several of the agricultural colleges and found to be quite harmless to cattle. Its composition is practically the same as that of Egyptian cotton cake, and it now makes on the market practically the same price.

Soya-bean cake is another instance of a new food which has been similarly tested, and found to be safe for cattle if used in rather small quantities and mixed with cotton cake. The price is now rapidly rising to that indicated by its analysis. Work of this kind is, and always will be, most useful. Trials with few animals, whilst they cannot measure accurately the feeding value of a new food, are quite good enough to demonstrate its general properties, and its price will then gradually settle itself as the food gets known.

Turning to the more strictly scientific aspects of animal nutrition, entirely new ideas have arisen during the last twenty years. Twenty years ago the generally accepted view of the *rôle* of proteins in nutrition was that the proteins ingested were transformed in the stomach and got into peptones, and absorbed as such without further change. Splitting into crystalline products, such as leucin and tyrosin, was thought only to take place when the supply of ingested protein exceeded the demand, and peptones remained in the gut for some time unabsorbed. It is now generally agreed that ingested protein is normally split into crystalline products which are separately absorbed from the gut, and built up again into the various proteins required by the animal. If the ingested protein does not yield a mixture of crystalline products in the right proportions to build up the proteins required, those crystalline products which are in excess are further changed and excreted. If the mixture contains none of one of the products required by the animal, then life cannot be maintained This has been actually demonstrated in the case of zein, of the proteins of maize, which contains no tryptophane. The addition of a trace of tryptophane to a diet, in which zein was the only protein, markedly increased the survival period of mice.

The adoption of this view emphasises the importance of a knowledge of the composition of the proteins, and especially of a quantitative knowledge of their splitting products, and much work is being directed to this subject in Germany, in America, and more recently in Cambridge, as a result of the creation there of an institute for research in animal nutrition by the Board of Agriculture and the Development Commission. This work is expected ultimately to provide a scientific basis for the compounding of rations, the idea being to combine foods the proteins of which are, so to speak, complementary to each other, one giving on digestion much of the products of which the other gives little. Meantime, it is desirable that information should be collected as to mixtures of foods which are particularly successful or the reverse.

Here the question arises, for what purpose does the animal require a peculiarly complicated substance like tryptophane? The natural suggestion seems to be that the tryptophane grouping is required for the building up of animal proteins. If has also been suggested that such substances are required for the formation of hormones, the active principles of the internal secretions the importance of which in the animal economy has received such ample demonstration in recent years. The importance of even mere traces of various substances in the animal economy is another quite recent conception. Thus it has been shown, both in Cambridge and in America, that young animals fail to grow on a diet of carefully purified casein, starch, fat, and ash, although they will remain alive for long periods. In animals on such a diet, however, normal growth is at once started by the addition of a few drops of milk or meat juice, or a trace of yeast, or other fresh animal or vegetable matter. The amount added is far too small to affect the actual nutritive value of the diet. Its effect can only be due to the presence of a trace of some substance which acts, so to speak, as the hormone of growth. The search for such a substance is now being actively prosecuted. Its discovery will be of the greatest scientific and practical interest.

Evidently new ideas are not lacking amongst those who are engaged in investigating the *rôle* of the proteins and their splitting products in the animal economy. But of more immediate practical interest is the question of the amount of protein required by animals under various conditions. It is obviously impossible to fix this amount with any great accuracy, since pro-

teins differ so widely in composition, but from many experiments, in which a nitrogen balance between the ingesta and the excreta was made, it appears that oxen remain in nitrogenous equilibrium on a ration containing about one pound of protein per 1,000 lb. live-weight per day. All the British experiments of a more practical nature have been recalculated on a systematic basis by Ingle, and tabulated in the Journal of the Highland and Agricultural Society. From them it appears that increase of protein in the ration, beyond somewhere between one and a half and two pounds per 1,000 lb. live-weight per day of digestible protein ceases to have any direct influence on increase in live-weight.

We may fairly conclude, then, that about two pounds of proteins per 1,000 lb. live-weight per day is sufficient for a fattening ox. This amount is repeatedly exceeded in most of the districts where beef production is a staple industry, the idea being to produce farmyard manure rich in nitrogen. The economy of this method of augmenting the fertility of the land is very doubtful. The question is one of those for the solution of which a combination of accurate experiment and modern accountancy is required. Protein is the most expensive constituent of an animal's dietary. If the scientific investigator, from a study of the quantitative composition of the proteins of the common farm foods, and the economist, from careful dissection of farm accounts, can fix an authoritative standard for the amounts of protein required per 1,000 lbs. live-weight per day for various types of animals, a great step will have been made towards making mutton and beef production profitable apart from corn-growing.

For many years it has been recognised that an animal requires not only so much protein per day, but a certain quota of energy, and many attempts have been made to express this fact in intelligible terms. Most of them have taken as basis the expression of the value of all the constituents of the diet in terms of starch, the sum of all the values being called the starch equivalent. This term is used by various writers in so many different senses that confusion has often arisen, and this has militated against its general acceptance. Perhaps the most usual sense in which the term is used is that in which it means the sum of the digestible protein multiplied by a factor (usually 94) plus the digestible fat multiplied by a factor (usually 2·31), plus that digestible carbonydrates. This, however, gives misleading values which are too high in concentrated foods and too low in bulky foods, the discrepancy being to the larger proportion of the energy of the bulky foods which is used up in the much greater work of digestion which they require. Kellner and his school has devised a method which measures the starch equivalent by experiment, a much more satisfactory and practical method than any system which depends purely on calculation.

An animal or a number of animals are kept on a maintenance diet so that their weight remains constant. To this diet is added a known weight of starch, and the increase in weight observed. The animal or animals are then placed again on the same maintenance diet for some time, and then a known weight of the food to be tested is added, and the increase in weight again observed. The data thus obtained indicate that so many pounds of starch produce as much increase in live-weight as so many pounds of the food under experiment, from which it is easy to calculate how many pounds must increase in live-weight as 100 lb. of the food under experiment. The starch equivalent thus found expresses an experimentally determined fact which is of immediate practical value, in arranging a dietary, its value, however, depending on the accuracy with which it has

been determined. Kellner and his colleagues have thus determined the starch equivalents of all the commonly used foods. Their values for concentrated foods, and other foods commonly used in Germany have been determined with considerable accuracy, and with the method which has also been devised for defining the relation between the experimentally determined equivalent and the equivalent calculated from the analysis by means of a formula, they form by far the most trustworthy basis for arranging a feeding ration including such kinds of foods.

But roots, which form the staple of the diet of fattening animals in Great Britain, are not used on the same scale in Germany, and Kellner's starch equivalents for roots have not been determined with sufficient accuracy or under suitable conditions to warrant their use for arranging diets under our conditions.

This, and the fact that the term starch equivalent is so widely misunderstood, is no doubt the reason why the Kellner equivalent has not been more generally accepted in Great Britain. An advance will be made in the practice of feeding as soon as the starch equivalent of roots has been accurately determined under our conditions when the Kellner equivalents will no doubt come into general use.

I have now reached the end of my survey. I recognise that it is very incomplete, and that I have been compelled to neglect whole subjects in which important work has been done. I venture to hope, however, that my words have not been altogether unprofitable. It is somewhat difficult to summarise what is in itself really nothing but a summary. Perhaps, however, I may be allowed to point out once more what appears to me to be the moral of the last twenty years of work in agricultural science.

The many practical field and feeding tests carried out all over the country have demonstrated several very striking results; but, if they are to be continued with profit, more trouble must be taken to insure accuracy. Farmers are ready to listen. It behoves us more than ever to found what we tell them on accurate results.

Besides such practical trials, however, much has been done in the way of individual scientific work. The results thus obtained, as, for instance, Russell and Hutchinson's partial sterilisation of soils, Biffen's new wheats, and Beaven's pure Archer barley, are of practical value to the farmer as immediate as the most practical field trials, and of far wider application. —*Nature.*

CEYLON.

RUBBER EXPORTS.

The following statistics of the exports of rubber of domestic production from Ceylon during the month of July, and the seven months ended July, 1912 and 1913, have been extracted from official returns issued by the Ceylon Government:—

To	July 1912	July 1913	Jan.-July 1912	Jan.-July 1913
	Lbs.	Lbs.	Lbs.	Lbs.
United Kingdom ...	750,930	1,274,318	3,943,655	6,468,257
United States ...	274,700	515,393	2,042,505	3,723,904
Other countries ...	159,228	326,140	975,649	2,350,546
Total exports of rubber of domestic production ...	1,184,858	2,115,851	6,951,802	12,542,707

The Board of Trade Journal.

CORRESPONDENCE.

The Labour Commission.

THE EDITOR,
The Planters' Chronicle,
Bangalore.

Sir,—The correspondence under this head in your issue of 6th inst. is most interesting, and as you say, the more opinions we have ventilated the more easily will the Committee be able to grasp the situation as generally viewed by planters.

I must confess myself quite unable to understand Mr. Newcome's objections. Why should the establishment of a Labour Commission (I like Mr. Hunt's "Bureau") make it easier for Rubber and Tea Concerns to draw away his or any Coffee planters labour? They are doing that to help him to *keep* his advanced labour, as the maistries and coolies advanced by him will be watched, refused a second advance by anyone who has joined the Bureau, and traced and hunted if they take the wrong road. As to "crimping," Government has laid down that the cooly is a free agent and can only be secured for one season; he is at perfect liberty to pay up and change his maistry or estate for the next season; and competition will see that he probably does, whether we have a Bureau or not. But I do not call that crimping—what I understand by crimping is the deliberate enticing away of an engaged man from his engagement by further advances or other means. I have had coolies enticed away to other districts, who owed my maistries large sums. I have written in vain to the crimper and the Manager of the estate they were enticed to—and I believe that with a Labour Bureau those coolies would either not have been carried off, or they would have been so hunted that they would have possibly wished that they had not listened to the voice of the charmer. As things are, I can do nothing. I believe that the registration of coolies and the general check on their taking advances from two or more maistries will be warmly welcomed by the honest suppliers, who after all are in the majority. I cannot for the life of me see what encouragement a Labour Commission can or will give to the enticement of labour from one place to another, just as I do not expect it to keep my coolies with me if the attractions elsewhere are greater. The Labour Commission is an attempt to bring into some order the chaos now prevailing; it is likely to be a check on the rogue, and a help to the honest man.

But we must be reasonable—the time is passed when gods and goddesses sprang to life fully grown and fully armed, and set the affairs of men straight at a word. We are planters, and we should understand that seed must be sown, jungle cleared, and much work put in before we gather crops. To paraphrase Mr. Mead, there is too much of 9*d* for 4*d*. wanted—too many people seem to want immediate and heavy dividends for their investment in the Commission; they have forgotten what the late Chairman said when closing the last meeting of the U. P. A.—"that it was gratifying to find delegates .....are ready to go back to their Associations and ask them *to make considerable sacrifices* for our future welfare." *Future* welfare is what our best minds are always impressing on us, the rank and file.

Mr. Mann's letter is most welcome, and to me most refreshing. I think we have all shrunk from pointing out what seemed so obvious, but apparently it was necessary, and he is to be congratulated on taking his courage in both hands and so clearly and reasonably teaching the A B C of the matter. As to those who do not lose in advances at present the amount that they are asked to contribute to the Labour Commission, let them read and *digest* what Mr. Richardson said at the Mundakayam Association

Meeting. We have to look to the *future*, those of us who are not suffering now. Also, let them take note of what Mr. Dandison said at the Nilgiri Meeting anent the once-secure local labour. Let them not forget that all things in this world change, and that unless we adapt ourselves to the changing conditions, we get left. We shall *all* probably be soon in Mr. Richardson's Class III, and if we possess an organization to secure to us more or less the labour we have found and advanced, we shall be in a better position (and one well worth Re. 1-4 an acre) than if we sit quaking with fear as to whether it has all gone off to other districts.

I do not expect wonders the first year, or even the second—but I do believe with Mr. Mann that the disciplining of the coolies will in time tend greatly to our advantage.

I have already expressed the opinion that the Assistant Commissioners will probably be of most use to us, and suggested that their salaries be increased at the expense of the Head Commissioner and Mr. Hunt now recommends 6 instead of 3 Assistants, to be paid for similarly We shall probably need 6; but I have thought over the matter (and more especially since reading Mr. Martin's letter on direct recruiting) and now feel that if we could secure such experience as his the salary of the Head Commissioner would be well laid out—and I would rather pay a little more per acre to secure good assistants. This will probably not be a popular suggestion.

Notwithstanding the fluctuating character of an income to be derived from a cess on crops, as suggested by Mr. Mead, I am inclined to think that this plan would be more popular than a hard and fast acreage tax. Immature areas would be unburdened—poor estates would pay less than good ones —the wind would be tempered to the fleecing of the lamb—and the expenditure could be regulated to suit the *average* income of the Commission, much as we have to regulate our own, on incomes which fluctuate in the same way. It seems to me a very good suggestion.

The trouble is that until the prospectus is cut and dried, many will not join; and unless it is known who will join, it is next to impossible to have a cut and dried plan.

The matter is so important, that I would rather see it delayed and still further discussed than rushed through at the risk of half the community standing out. I reproduce a remark of Mr. Barnard in your issue of August 9th—"The truths in connection with the Labour Question are not yet *commonplaces* to Managers and Superintendents, and consequently they have not acquired the force of 'operative motives'." Many absentee proprietors are against the Commission, for they are not in touch with labour problems and it is not given to everyone to put things as he himself sees them, so perhaps these proprietors are not greatly helped in some instances by their representatives here. To such I would suggest a thorough perusal of your issue of December 6th, where Mr. Richardson, Mr. Mead, and Mr. Mann have said much that should be convincing.

Yours faithfully,
C. DANVERS.

THE EDITOR, 9th December, 1913.
The Planters' Chronicle,
Bangalore.

Sir,—Mr. Mead's suggestion that the funds required for the Labour Commission should be raised on the crops actually harvested seems to be carrying the principle of brotherly love a "leetle" too far. Producers to assist potential competitors to become actual ones is more than most Boards will swallow, I should imagine.

It is ninepence for fourpence for the immature ones and no mistake.

Yours faithfully,
"A POTENTIAL COMPETITOR."

THE EDITOR, 9th December, 1913.
The Planters' Chronicle,
Bangalore.

Dear Sir,—In the "Contents" page of your issue No. 49 you remark "In the letters published there is much food for thought." I agree but regret to observe that a great deal of it is very indigestible.

Yours faithfully,
"DYSPEPTIC."

December 11th, 1913, Rob Roy, Kotagiri, Nilgiris.

Tea Packing.

THE EDITOR,
The Planters' Chronicle.
Bangalore.

Dear Sir,—In continuation of the correspondence between "One Interested" in the *Planters' Chronicle* of 15th ultimo and Mr. Groves reply of November 29th I enclose a pamphlet recently received from London which may be of interest, and will clearly show the most correct method of packing a chest of Tea to avoid any loss in weight in London.

Yours faithfully,
ERNEST S. CLARKE.

In order to fully benefit by the system of weighing now in vogue by the London Customs Authorities, the following hints will prove of value.

The Customs now give the turn of the scale on the gross against the Importer, but on the Tare either for or against the Importer when it weighs under or over the half-pound.

The Tare (that is the weight of the empty package, complete with lid, lead, hoop iron and nails, etc.) should weigh four ounces over the pound, whether the package be chest or half chest.

The Gross weight of a package must in all cases weigh four ounces over the pound, whether the package be chest or half chest.

Subjoined is an example of the correct method of packing a chest to contain 100 lbs. of Tea.

Garden Weights.			Customs Weights, London.		
Tare.	Tea Net.	Gross Weight.	Gross Weight.	Tare.	Net.
27 lbs. 4 oz.	100 lbs.	127 lbs. 4 oz.	127 lbs.	27 lbs.	100 lbs.

From the above it will be seen that a margin of 4 oz. remains for any slight variations in weight of package during transit, and that no loss need result from the Customs Weighing under this system.

It is most important that the weights of the Weighing Machine, used on the Estate, should be constantly checked, and for this purpose a set of test weights should be kept. A beam scale is to be preferred to a platform one, as the former is the more accurate.

When a Superintendent, to equalize the tares of his package, adds pieces of lead or wood for that purpose, the material so added should be fixed inside the package, so as to prevent it falling out when the package is opened in London.

A Superintendent may "tare" and pack his teas with the greatest care, but if he afterwards permits his carpenter to plane away from the top of the package before nailing down, all his careful work may be wasted.